

BIOMASS SYSTEMS: RESIDENTIAL AND LIGHT COMMERCIAL

APPLICATIONS

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ATI Systems

- Manufacturing Representative and Design Firm
 - Radiant Floor Heat
 - Snowmelt
 - Hydronic Systems

*Biomass

How we came to Biomass

- Personal economic necessity
- 2008
 - Fuel Oil prices at \$4.00 per gallon
 - Burning 1200 gallons a year
 - Almost \$5000 annual heating bill



Opportunities for small scale Biomass Heating Equipment:

Small Scale Biomass Central Heating Systems

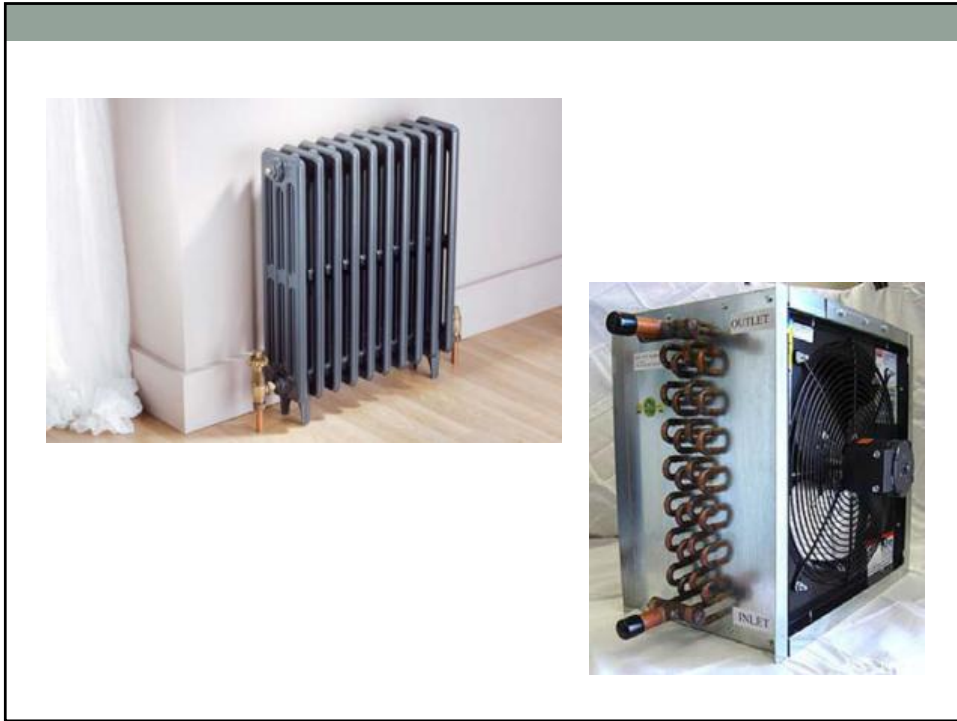
Three Categories

- A. Cord Wood/Scrap Wood
- B. Pellet Fired Equipment
- C. Wood Chip Fired Equipment

Cord Wood/Scrap Wood

- Hot Water/ Boiler Options
 - Applications
 - Radiant Floor heat
 - Snow Melt systems
 - Hot water unit heaters
 - Radiators
 - Ducted Fan Coils
 - Domestic hot water
 - Hot water for manufacturing



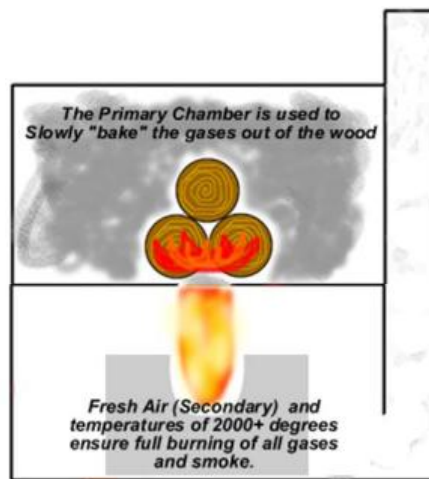


Hot Water Boiler Configurations

1. Outdoor vs. Indoor units
2. Gasifying vs. Non-gasifying models
3. Thermal Storage



Gasification



Thermal Storage: Why?

1. Prevents short cycling equipment
 - Higher efficiency
 - Reduces emissions
2. Allows long run times
3. Allows system to heat long after the boiler is done burning
4. Gives opportunity to make domestic hot water easily



Froling FHG Cord Wood Boiler

- Down draft gasifier
 - **Extremely low smoke production
- Modulating
- Computer driven lambda control system
 - Knows where it is in the cycle
 - Operates separate primary and secondary air
 - Shuts down, saving charcoal
- Ultra-fast relight from cold charcoal
- Internal heat exchange/ cleaning system
- Very high efficiency, requiring thermal storage





Pellet Fired Equipment

- Hot Water/Boiler
 - Array of applications similar to Wood fired boilers
 - Radiant Floor heat
 - Snow Melt systems
 - Hot water unit heaters
 - Radiators
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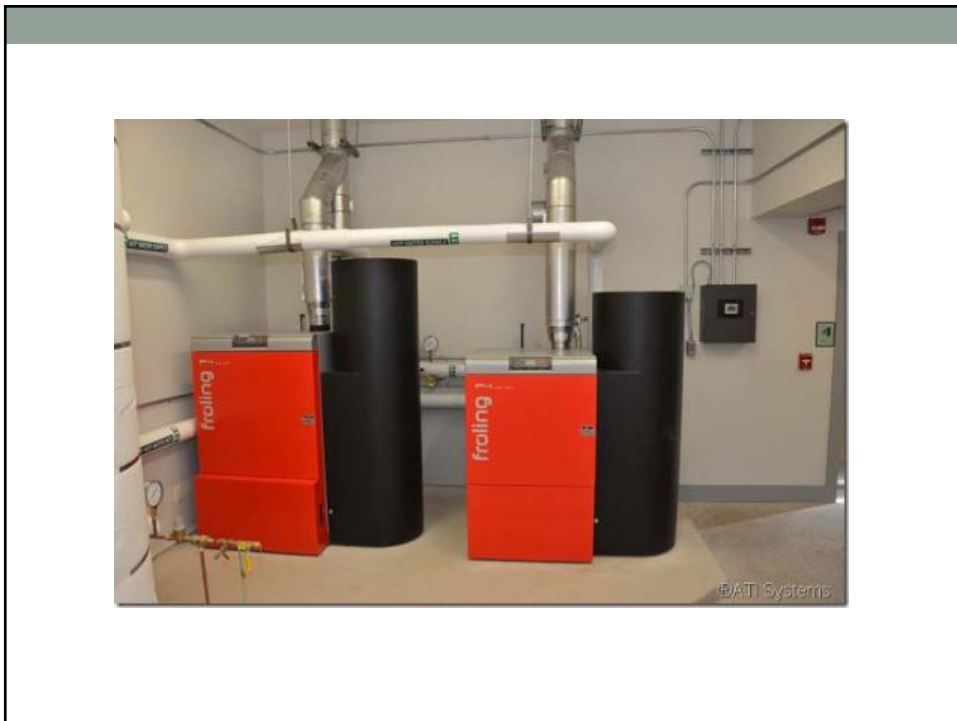
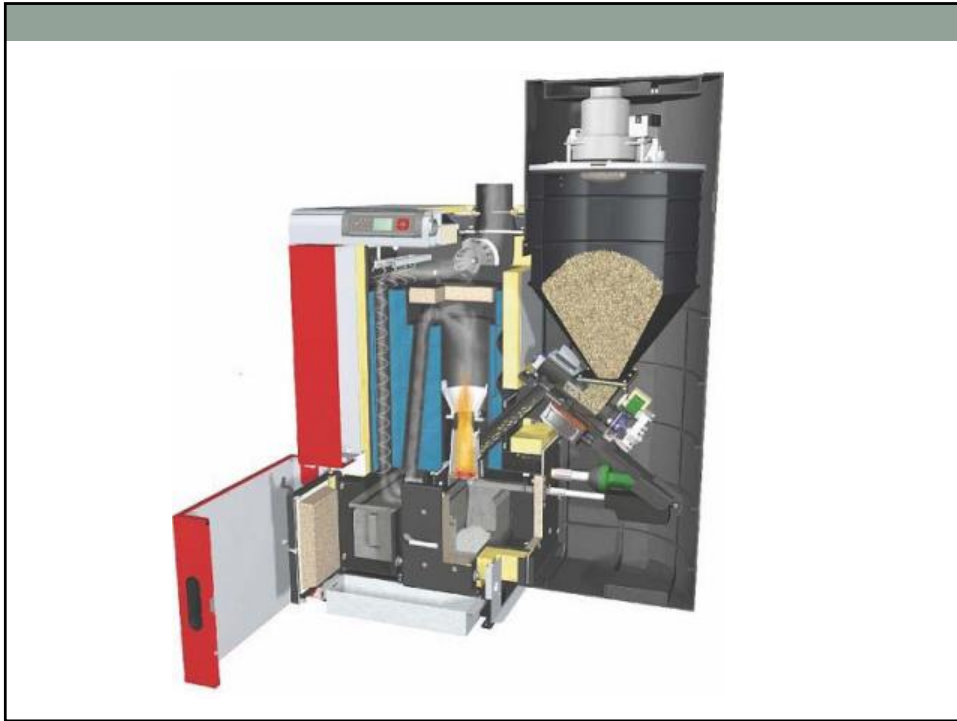
Froling P4 Pellet Boilers

- Brand new concept in the last decade
- Represents a REAL alternative to fossil fuel
- Setting industry standards in North America for quality, efficiency, and ease of use since 2008
- WHAT DOES IT DO?

Froling P4 Pellet Boiler

- ✓Loads Itself
- ✓Lights Itself
- ✓Modulates its output
- ✓Automatically cleans its heat exchanger
- ✓Collects and packs its own ash boxes

Truly represents an automatic heat system!

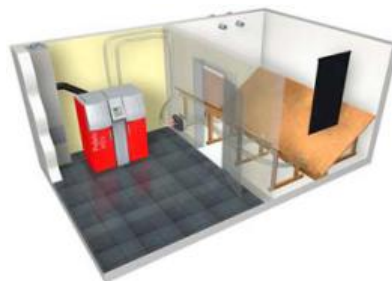


Other Key Features

- Extremely low smoke output
- Active fire grate cleaning
- Vacuum pellet fill system
- Day hopper (programmable filling)
- Up to 86.4% efficiency
- Integrated solar thermal controls
- Cascade Control Network
 - **Important for Commercial Application

Bulk Pellet Storage Options

1. Grain Towers
2. Indoor Bins
3. Indoor/Outdoor Bags



Weiser State Forest



Weiser State Forest



Weiser State Forest



Weiser State Forest



Weiser State Forest



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Wood Chip Fired Equipment

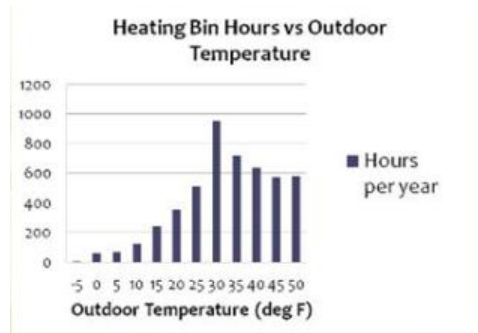
- Almost exclusively boilers
- Similar applications and considerations as Pellet boilers
- Typically start at about 500 MBH because of cost of constructing equipment and payback on investment
- Froling TX150 Chip Boiler
 - 510 MBH output
 - Similar features and benefits of the P4 pellet boiler



Light Commercial Biomass Special Considerations

1. Equipment sizing: DO NOT OVERSIZE
2. Heat Emitters: future proofing your system
3. Fuel Storage
4. Thermal Storage Requirement
5. Secondary/ Back-up systems
6. Ash Removal
7. Monitoring Systems

Equipment Sizing

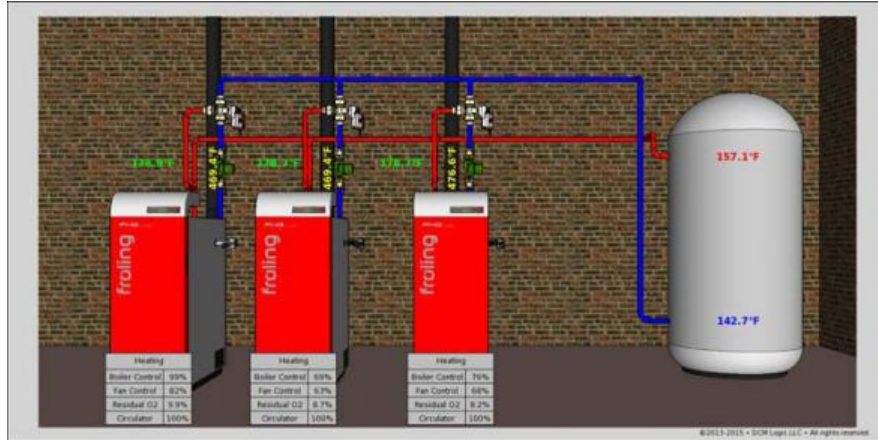


80% of heating output is needed at 50% or less of peak heating load

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Monitoring System



Who are Light Commercial Biomass Users?

- Small Businesses and Institutions chained to Oil or Propane
- Users with moderately high heat demand
- Innovative Institutions wanting to Go Green
- Examples: Schools, Colleges, Maintenance/service facilities, Inn's, Bed and Breakfasts, Farms, Car washes, Small manufacturing operations, and Places of Worship